FORM PTO-1390 REV. 5-93	US DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE	ATTORNEYS DOCKET NUMBER P00,0579
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371		U.S.APPLICATION NO. (if known, see 37 CFR 1.5) 09/555032
INTERNATIONAL APPLICATION NO. PCT/DE98/03366	INTERNATIONAL FILING DATE 16 November 1998	PRIORITY DATE CLAIMED 21 November 1997

TITLE OF INVENTION
"METHOD AND DEVICE FOR VOICE RECOGNITION"

APPLICANT(S) FOR DO/EO/US
Alfred HAUENSTEIN

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay.
4. ☒ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.

5. ☒ A copy of International Application as filed (35 U.S.C. 371(c)(2))
   a. ☒ is transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ has been transmitted by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English (35 U.S.C. 371(c)(2).

7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. §371(c)(3))
   a. ☐ are transmitted herewith (required only if not transmitted by the International Bureau).
   b. ☐ have been transmitted by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.

8. ☐ A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).

9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).)

10. ☒ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 C.F.R. 1.97 and 1.98; **(PTO 1449, Prior Art, Search Report).**

12. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 C.F.R. 3.28 and 3.31 is included. **(SEE ATTACHED ENVELOPE)**

13. ☒ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.

14. ☐ A substitute specification.

15. ☐ A change of power of attorney and/or address letter.

16. ☒ Other items or information:
    a. ☒ Submittal of Drawings
    b. ☒ **EXPRESS MAIL #EL482398463 US, dated May 22, 2000.**

U.S.APPLICATION NO. (if known, see 37 C.F.R. 1.5)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
09/555032	PCT/DE98/03366	P00,0579

17. ☒ The following fees are submitted:	CALCULATIONS	PTO USE ONLY
BASIC NATIONAL FEE (37 C.F.R. 1.492(a)(1)-(5):		
Search Report has been prepared by the EPO or JPO $840.00		
International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) . . $700.00		
No international preliminary examination fee paid to USPTO (37 C.F.R. 1.482) but international search fee paid to USPTO (37 C.F.R. 1.445(a)(2) $770.00		
Neither international preliminary examination fee (37 C.F.R. 1.482) nor international search fee (37 C.F.R. 1.445(a)(2) paid to USPTO $1040.00		
International preliminary examination fee paid to USPTO (37 C.F.R. 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4) . . . . . $ 96.00		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 840.00	
Surcharge of $130.00 for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 C.F.R. 1.492(e)).	$	

Claims	Number Filed	Number Extra	Rate		
Total Claims	11 - 20 =		X $ 18.00	$	
Independent Claims	2 - 3 =		X $ 78.00	$	
Multiple Dependent Claims			$260.00+	$	
			TOTAL OF ABOVE CALCULATIONS =	$ 840.00	
Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity statement must also be filed. (Note 37 C.F.R. 1.9, 1.27, 1.28)				$	
			SUBTOTAL =	$ 840.00	
Processing fee of $130.00 for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$	
			TOTAL NATIONAL FEE =	$ 840.00	
Fee for recording the enclosed assignment (37 C.F.R. 1.21(h). The assignment must be accompanied by an appropriate cover sheet (37 C.F.R. 3.28, 3.31). $40.00 per property +					
			TOTAL FEES ENCLOSED =	$ 840.00	
			Amount to be refunded	$	
			charged	$	

a. ☒ A check in the amount of $ 840.00 to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of $ _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 08-2290. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 C.F.R. 1.494 or 1.495 has not been met, a petition to revive (37 C.F.R. 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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SIGNATURE

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IN THE UNITED STATES ELECTED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

"**PRELIMINARY AMENDMENT**"

APPLICANT: Alfred Hauenstein

SERIAL NO.: EXAMINER:

FILING DATE: ART UNIT:

INTERNATIONAL APPLICATION NO.: PCT/DE98/03366

INTERNATIONAL FILING DATE: 16 November 1998

INVENTION: Method and Device for Voice Recognition

Hon. Assistant Commissioner for Patents
Box PCT
Washington D.C. 20231

SIR:

Amend the above-identified international application before entry into the national stage before the U.S. Patent & Trademark Office under 35 U.S.C. §371 as follows:

IN THE SPECIFICATION

On page 1, before the title, insert --

SPECIFICATION

TITLE--;

after the title, insert --

BACKGROUND OF THE INVENTION

Field of the Invention--;

in line 3, before "invention" insert --present--;

after line 3, insert --

Description of the Related Art--;

in line 5, delete "[1]" and insert --the reference A. Hauenstein, "Optimierung von Algorithmen und Entwurf eines Prozessors für die automatishce Spracherkennung"--;

in line 14, delete "[2]" and insert --the reference A. Hauenstein, "Optimierung von Algorithmen und Entwurf eines Prozessors für die automatishce Spracherkennung"--;

in line 20, delete "[2]" and insert --the reference A. Hauenstein, "Optimierung von Algorithmen und Entwurf eines Prozessors für die automatishce Spracherkennung"--; and

in line 26, delete "[3] and [4]" and insert --the references V. Steinbiss et al., "Improvements in Beam Search" and M. Niemöller et al., "A PC-based Real-Time Large Vocabulary Continuous Speech Recognizer for German"--.

On page 2, in lines 1 and 2, delete "[5] and [6]" and insert --the references A. Hauenstein, "Optimierung von Algorithmen und Entwurf eines Prozessors für die automatishce Spracherkennung" and S. Ortmanns et al., "Look-Ahead Techniques for Fast Beam Search"--;

in line 3, after "also" insert --referred to as--;

in line 7, change "combination" to --combinations-- and delete "[sic]";

in line 24, before "term" insert --for which is used the--;

in line 27, delete "[5]" and insert --the reference A. Hauenstein, "Optimierung von Algorithmen und Entwurf eines Prozessors für die automatishce Spracherkennung"--; and

in line 29, delete "[6]" and insert --the reference S. Ortmanns et al., "Look-Ahead Techniques for Fast Beam Search--.

On page 3, in line 5, delete "[6]" and insert --the reference S. Ortmanns et al., "Look-Ahead Techniques for Fast Beam Search"--;

in line 7, delete "[sic]" and delete "[7]" and insert --the reference E. Bocchieri, "Vector Quantization for the Efficient Computation of Continuous Density Likelihoods"--;

in line 8, change "multi-step" to --multi-stepped--;

after line 12, insert --

SUMMARY OF THE INVENTION--;

in line 14, change "The object of the invention is to create a" to --An object of the present invention is to provide a--;

in line 17, delete "the features of the independent claims" and insert --by the method for voice recognition, in which spoken language is recognized using a voice recognition system, whereby the voice recognition system runs on a computer; a performance index of the computer is determined by a program for computer performance assessment; an input quantity for the voice recognition system is automatically specified using the performance index; and the accuracy of the voice recognition system is automatically adjusted to the obtained computing power of the computer using this input quantity.--; and

in line 22, before "computer" insert --a--.

On page 4, in line 7, replace "said" with --the--; and

in line 25, before "for" insert --of this specification--.

On page 6, in line 20, replace "plurality" with --number--.

On page 7, in line 6, delete "emerge from the dependent claims" and insert --include providing that the values for the system parameters of the voice recognition system are determined in that the values are computed from the input quantity in accordance with a mapping specification. The mapping specification may be converted using a table. Preferably, the setting process is executed during the operation of the voice recognition system. According to one embodiment, the voice recognition system comprises at least one of the following system parameters: a) pruning threshold; b) histogram pruning; c) acoustic look-ahead; d) language model look-ahead; e) threshold for selecting distance parameters that are to be computed. At least one of the system parameters is specified using the input quantity. In a preferred development, the system parameters are weighted with respect to their influence on a respective target quantity. Specifically, a target quantity is at least one of the following quantities:
a) accuracy of the voice recognition system; or b) speed of the voice recognition system. The system parameters may be weighted equally. Alternately, the system parameters are weighted according to a prescribed weighting table.

As a further development of the invention a device for voice recognition is provided, including a voice recognition system, means for adjusting an accuracy of the voice recognition system, the means being so arranged that system parameters of the voice recognition system are adjustable, and the system parameters being computable using an input quantity.--;

after line 6, insert --

BRIEF DESCRIPTION OF THE DRAWINGS--;

in line 11, delete "Shown are:";

in line 13, after "Figure 1" insert --is a flow chart of--;

in line 14, after "Figure 2" insert --is--;

in line 16, after "Figure 3" insert --is--;

in line 18, after "Figure 4" insert --is--;

in line 20, after "Figure 5" insert --is a diagram-- and delete "a sketch";

in line 22, after "Figure 6" insert --is--;

in line 23, after "Figure 7" insert --is a block diagram of"; and

after line 23, insert --

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS--.

On page 9, in line 16, delete "aheadm [sic]" and insert --ahead--; and

in line 28, change "Here." to --Here,--.

On page 11, after line 6, add the following new paragraph --

Although other modifications and changes may be suggested by those skilled in the art, it is the intention of the inventors to embody within the patent warranted hereon all changes and modifications as reasonably and properly come within the scope of their contribution to the art.--.

Delete page 12.

IN THE CLAIMS

On substitute page 13, before line 1, insert --I Claim:--.

Amend the claims as follows:

1. (Amended) A method [Method] for voice recognition, in which spoken language is recognized using a voice recognition system, [whereby] comprising the steps of:

a) running the voice recognition system [runs] on a computer;

b) determining a performance index of the computer [is determined] by a program for computer performance assessment;

c) automatically specifying an input quantity for the voice recognition system [is automatically specified] using the performance index; and

d) automatically adjusting [the] accuracy of the voice recognition system [is automatically adjusted] to an [the] obtained computing power of the computer using said [this] input quantity.

2. (Amended) A method [Method] as claimed in claim 1, further comprising the step of: [in which the]
determining values for [the] system parameters of the voice recognition system [are determined] in that the values are computed from an [the] input quantity in accordance with a mapping specification.

3. (Amended) A method [Method] as claimed in claim 2, further comprising the step of: [in which]
converting the mapping specification [is converted] using a table.

4. (Amended) A method [Method] as claimed in claim 1, further comprising the step of: [one of the preceding claims, in which the]
executing a setting process [is executed] during [the] operation of the voice recognition system.

5. (Amended) A method [Method] as claimed in claim 1, wherein said accuracy adjusting step of [one of the preceding claims, in which] the voice recognition system includes adjustment by [comprises] at least one of the following system parameters:
a) pruning threshold;
b) histogram pruning;

c) acoustic look-ahead;

d) language model look-ahead; and

e) threshold for selecting distance parameters that are to be computed.

6. (Amended) A method [Method] as claimed in claim 5, further comprising the step of: [in which]

specifying at least one of the system parameters [is specified] using the input quantity.

7. (Amended) A method [Method] as claimed in claim 6, further comprising the step of: [in which]

weighing the system parameters [are weighted] with respect to their influence on a respective target quantity.

8. (Amended) A method [Method] as claimed in claim 7, wherein said [in which a] target quantity is at least one of the following quantities:

a) accuracy of the voice recognition system; and

b) speed of the voice recognition system.

9. (Amended) A method [Method] as claimed in claim 7 [or 8], further comprising the step of: [in which]

weighting the system parameters [are weighted] equally.

10. (Amended) A method [Method] as claimed in claim 7 [or 8], further comprising the step of: [in which]

weighting the system parameters [are weighted] according to a prescribed weighting table.

11. (Amended) A device [Device] for voice recognition, comprising: [a) in which]

a voice recognition system; and [is provided, b) in which]

means [are provided] for adjusting an accuracy of the voice recognition system, said means being so arranged that system parameters of the voice recognition system are adjustable, said system parameters being computable using an input quantity.

IN THE ABSTRACT

In the abstract, delete the title.

REMARKS

The foregoing amendments to the specification and claims under Article 41 of the Patent Cooperation Treaty place the application into a form for prosecution before the U.S. Patent and Trademark Office under 35 U.S.C. §371. Accordingly, entry of these amendments before examination on the merits is hereby requested.

SCAN 8 NOV 0

Respectfully submitted,

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ATTORNEY FOR APPLICANT

4 Pats

Method and Device for Voice Recognition

The invention relates to a method and a device for voice recognition.

A voice recognition system is taught in [1]. This also contains a basic introduction to the components included in the voice recognition system, as well as important techniques that are common in voice recognition.

In a known voice recognition system, a degree of accuracy – that is, a measure of a quality of the recognition – is predetermined. The user must now make do with this system, even when a lower degree of accuracy would suffice for his application, though he would achieve a higher operating speed in the bargain.

The principle of pruning a search space is known from [2] (see chapter 3.3.3, page 40). This is a matter of "trimming" the search space, or rather a method for reducing a number of search paths of the search space, whereby the least promising search paths are cut off. To this end, first a search path with minimal costs (optimal search path) is established. Then, all search paths (branches of the search tree) whose costs are above the minimum inclusive of an added prescribed evaluation quantity, which is referred to as the pruning threshold, are cut off. For a detailed explanation of the pruning: [2], p. 40ff; particularly Figure 16 on page 41.
When a pruning threshold is used, it is not known how many search paths will remain in the search tree. If one wishes to maintain the number of these remaining search paths at a predetermined level, the pruning threshold is dynamically adapted.

A histogram pruning is taught in [3] and [4]. Here, a predetermined number of "best" search paths are used – that is, search paths with a high probability of occurrence – in that frequencies of the search paths are evaluated in the form of a histogram. The pruning threshold is dynamically modified.

An acoustic look-ahead in the search tree (term of art: fast look ahead) is taught in [5] and [6].

The idea pursued in the acoustic look-ahead (also fast preselection) is based on the characteristic of a language that all words are composed of a limited inventory of linguistic subunits (e.g. phonemes, half-syllables). An acoustic weighting is now performed for these linguistic subunits "in advance". Only those combination **[sic]** of linguistic subunits are tracked whose acoustic weights are below a predetermined threshold. An advantage in the weighting outlay is that, for a low number of linguistic subunits, a measure of the agreement of a speech signal that is to be recognized, on one hand, and a target quantity, on the other hand, is computed in advance and used as a basis for deciding whether a large part of the search tree should be excluded from consideration. Simply put, this means that more search paths in the search tree are reserved than are added in by the prediction. A profit like this grows larger the higher the ratio of new word beginnings to a number of linguistic subunits becomes. This ratio increases with the number of linguistic subunits, or respectively, words, that are to be recognized (lexicon size).

An advantage of the method of acoustic look-ahead consists in the regularity of the algorithms for computing the corresponding scores. Since there are no branchings in the search space due to word ends, syntactic nodes, and so on, the schema of the calculation of the scores is regular. Exactly for this reason, it is possible to use this type of method for an implementation in hardware also.

The prediction of the scores (term of art: fast match scores) is possible because the actual search lags behind the current extracted scores of the speech signal by a fixed number of time windows. Using the current scores, the prediction of the scores of further linguistic subunits is performed (see [5], p. 65, Figure 33).

This type of look-ahead is also carried out in language models (see [6]).

The principle of language model look-ahead is to take the probabilities existing in the language model into account in the search process as soon as possible, and also in the associated pruning. This is achieved by a factorization of the probabilities in the language model. A detailed description with a formal notation is contained in [6].

Finally, a threshold for selecting computing **[sic]** distance parameters is taught in [7]. Such selection methods are generally multi-step. First, a rough calculation is performed using a part of the distances. In the next step, those distances are determined which are close to the best distance of the first computational step with respect to an interval score. This interval score can be varied via a threshold, whereby the computing outlay for determining the distance parameters is varied.

The object of the invention is to create a method and a device for adjusting the accuracy of the voice recognition system.

This object is achieved by the features of the independent claims.

A method for adjusting the accuracy of a voice recognition system is set forth, in which the accuracy is determined by a prescribable input quantity. With the aid of this input quantity, values for system parameters of the voice recognition system are computed, preferably by computer. With the aid of these values, the voice recognition system is adjusted. This is preferably accomplished by the computer automatically.

The advantage of the invention is that it makes the accuracy of the voice recognition system adaptable and at the same time adjustable to laypersons. Depending on the application, or respectively, on the computing power available for the voice recognition system on the computer, various requirements can be placed on the quality of the voice recognition system simply by adapting the input quantity.

One development consists in calculating the values for the system parameters of the voice recognition system from the input quantity in accordance with a mapping specification. This mapping specification can be converted using a table.

By setting the input quantity, it is also possible to automatically compute the values of the system parameters of the voice recognition system that are linked to these and thus to automatically make said values accessible to the voice recognition system. Filing the values in a table has the advantage that an individual adjusting of various values of the input quantity to respectively different values of the system parameters can be carried out.

Another development consists in performing the setting during the operation of the voice recognition system. The advantage of this is that the adjustment of the voice recognition system can be individually adapted according to the respective requirements during the operation of the voice recognition system.

An additional development of the invention consists in specifying at least one of the following system parameters with the aid of the input quantity:

a) pruning threshold;

b) histogram pruning;

c) acoustic look-ahead

d) language model look-ahead;

e) threshold for selecting distance parameters that are to be computed.

Refer to the introduction for the meaning and function of these system parameters.

The cited system parameters represent a selection of possibilities. There are other imaginable system parameters, which can differ from those above depending on the respective voice recognition system.

It is also a development of the invention that the system parameters are weighted in consideration of their influence on a target quantity. The target quantity can be the accuracy of the voice recognition system or a speed of the voice recognition system (i.e. the speed at which the voice recognition process is carried out). In view of the respective target quantity, the system parameters can be weighted proportionally equally or differently in accordance with a predetermined weighting table.

In the context of another development, the input quantity is specified with the aid of an adjusting element.

The adjusting element advantageously comprises a one-dimensional degree of freedom with two limits, the first limit being converted as a maximum accuracy of the voice recognition system and the second limit being converted as a maximum speed of the voice recognition system.

It is also a development of the method that the adjusting element is represented on a computer as a slider and is operated with the aid of a keyboard, a touch-pad or a mouse.

The adjusting element can also be a rotary controller, a slider or a potentiometer.

In an additional development, the adjusting element is voice activated, the speech being evaluated by a voice recognition device, particularly the voice recognition system. The input quantity can be specified by voice input.

Another development of the method is that a fully automated specifying of the input quantity is carried out in the following steps:

A performance capability of the computer on which the voice recognition system is to run is determined using a program for performance assessment and is

stored as a performance index. In consideration of the performance index, the system parameters of the voice recognition system are automatically adjusted, thereby guaranteeing a high-performance voice recognition under real-time conditions, for example.

A program for determining the performance capability of the computer can be a prescribed loop, which runs through a definite number of iterations, the time for which iterations is measured. With the aid of a table, the performance index can be determined from the measured time. There are also programs that can be obtained commercially or as freeware which compute the performance of the computer and output a performance index as a rating of the performance capability.

A device for voice recognition is also set forth, which comprises a voice recognition system and which is realized with means for setting an accuracy of the voice recognition system, which means converts system parameters of the voice recognition system from an input quantity; that is, adjusts the voice recognition system and its numerous parameters with the aid of the input quantity.

It is advantageous here that such an adjusting of the system parameters with the aid of the input quantity can occur during the operation of the voice recognition system. This makes it possible for the user to easily adapt the plurality of system parameters.

In one development the input quantity can be specified automatically. To this end, what is known as a performance index is computed with the aid of a device for measuring the performance of the computer on which the voice detection runs, and this index is used for adjusting the accuracy of the voice recognition system.

Another development provides that the input quantity can be prescribed by an adjusting element. A variety of adjusting elements (potentiometers, virtual control

units on the computer, and so on) whose setting directly determines the accuracy of the voice recognition system can be used for this.

Steps of the inventive method can expediently be carried out on the cited device.

Developments of the invention emerge from the dependent claims.

Exemplifying embodiments of the invention are detailed below with the aid of the following Figures.

Shown are:

Figure 1 a system architecture for a voice recognition system;

Figure 2 a block diagram with steps of a method for setting the accuracy of a voice recognition system;

Figure 3 a block diagram representing a linking of an input quantity to at least one system parameter via a mapping specification;

Figure 4 a diagram representing different possible system parameters of the voice recognition system;

Figure 5 a sketch showing the influence of the system parameters on a target quantity;

Figure 6 a diagram showing different possibilities for adjusting the input quantity;

Figure 7 a voice recognition system with a means for setting the accuracy.

Figure 1 shows a system architecture for voice recognition (voice recognition system).

The recognition of naturally spoken language is predicated on an appropriate formalism for representing knowledge. A complete voice recognition system encompasses several processing levels. These include acoustics-phonetics, intonation,

syntax, semantics, and pragmatics. The processing levels in the recognition are represented in Figure 1.

The natural speech signal 101 enters the voice recognition system. There, a feature extraction is performed in a component 102. After the feature extraction, sounds are recognized with the aid of known acoustic-phonetic units 103 (see block 104). This is a matter of computing acoustic distance parameters. After the sound recognition 104, the lexical decoding (word recognition) occurs in block 106 with the aid of the pronunciation model, or respectively, word lexicon 105, and then a syntax analysis 108 with the aid of the language model 107 that encompasses the grammar. The word recognition 106 and the syntax analysis 108 represent the search for a correspondence for the speech signal. Finally, in a block 110 a semantic post-processing is performed, whereby contextual knowledge and pragmatics 109 are taken into account, and this finally results in the speech that is recognized by the voice recognition system.

Figure 2 shows a block diagram representing the steps of a method for setting the accuracy of a voice recognition system.

In a step 201, the accuracy of the voice recognition system is specified by a prescribable input quantity. Next, in a step 202 values for system parameters of the voice recognition systems are computed using these input quantities. Lastly, in a step 203 the voice recognition system is adjusted using the computed values.

Figure 3 shows a block diagram representing a linking of an input quantity to at least one system parameter via a mapping specification.

The cited input quantity 301 is mapped onto the system parameters SP 303 of the voice recognition system with the aid of a mapping specification 302. One input quantity 301 is advantageously allocated to several system parameters via the mapping specification. On the basis of this mapping specification 302, the voice

recognition system is adapted by specifying an input quantity; i.e., several system parameters SP are influenced by modifying one input quantity 301. The mapping specification 302 advantageously has the form of a table in which a column contains possible input quantities 301, and in a row of these columns several values for system parameters SP303 are allocated to the respective input quantity. The mapping specification 302 consists in the search for the entry (row) in the table that is allocated to the input quantity 301 and in the transfer of the found values for system parameters SP303 to the voice recognition system.

Figure 4 shows a diagram representing different possible system parameters of the voice recognition system. The system parameters SP of the voice recognition system, represented in a block 401, include at least one of the following parameters:

a) pruning threshold 402

b) histogram pruning 403

c) acoustic look-ahead 404

d) the language model look-aheadm **[sic]** 405

e) threshold for distance parameter 406.

Overall it is possible to imagine additional system parameters of the voice recognition system for performing a setting via the input quantity 301, indicated by the block 407.

Figure 5 shows a sketch representing the influence of the system parameters on a target quantity.

The system parameters SP (see block 501) exert influence on a target quantity ZG (see block 502). As described above, there are several system parameters SP1, SP2, and so on, which are represented in a block 503. Here, each individual system parameter SPi (i=1,2,...) influences the target quantity ZG by means of a weight Gi that is provided

for the respective system parameter SPi (represented in a block 504). By weighting the system parameters SP, it is possible to exert a variable influence on the target quantity ZG, depending on the system parameter SP.

Figure 6 shows a diagram representing the different possibilities for setting the input quantity. The setting of the input quantity, represented in the block 601, is accomplished using operating components of the computer R (see block 602), using control components 603, or using the computer itself (see block 604). To this end, the computer R comprises at least one means for setting the input quantity, such as a keyboard 605, a mouse 606, a touch-pad 607, or voice input 608 via the voice recognition system. Possible components for control, represented in the block 603, include a rotary control 609, a slider 610, or some other control 611, preferably a potentiometer. In addition, the computing power of the computer is automatically determined with the aid of a program that runs on the computer, and the input quantity for setting the voice recognition system is specified accordingly. It is thus guaranteed that an automatically adjusted computer guarantees a quality in the voice recognition process that is commensurate with its computing power. A compromise is automatically found between high quality in the voice recognition at the expense of computing power, or respectively, real-time recognition of the language, and rapid voice recognition with a correspondingly low demand for computing power but with significant compromises of the quality of the voice recognition.

Figure 7 shows a device consisting of a voice recognition system 701 and a means for adjusting the accuracy of the voice recognition system 702.

System parameters of the voice recognition system are specified by an input quantity using the means for adjusting the accuracy 702. To this end, the input quantity is allocated to a plurality of system parameters (pruning threshold, histogram pruning,

acoustic look-ahead, language model look-ahead, threshold for selecting distance parameters to be calculated, etc.), preferably with the aid of a prescribed table.

The input quantity can alternatively be specified using an adjusting element 703 or a device for determining the performance of the computer 704. Refer here to Figure 6 and the possibilities cited there for setting the input quantity.

The folowing publications were cited in this document:

[1] A. Hauenstein: "Optimierung von Algorithmen und Entwurf eines Prozessors für die automatische Spracherkennung"; Lehrstuhl für Integrierte Schaltungen, Technische Univerität München, Dissertation, 7-19-93, Chapter 2, pp.13-26.

[2] A. Hauenstein: "Optimierung von Algorithmen und Entwurf eines Prozessors für die automatische Spracherkennung"; Lehrstuhl für Integrierte Schaltungen, Technische Univerität München, Dissertation, 7-19-93, Chapter 3.3.3; pp. 40-43

[3] Volker Steinbiss, Bach-Hiep Tran, Hermann Ney: "Improvements in Beam Search." Proc. Intl. Conf. Speech and Language Processing; Yokahama 1994, pp. 2143-2146.

[4] M. Niemöller, A. Hauenstein, E. Marschall, P. Witschel, U. Harke: "A PC-based Real-Time Large Vocabulary Continuous Speech Recognizer for German", Proc. IEEE Intl. Conf. on Acoustics, Speech and Signal Processing; Munich 1997.

[5] A. Hauenstein: "Optimierung von Algorithmen und Entwurf eines Prozessors für die automatische Spracherkennung"; Lehrstuhl für Integrierte Schaltungen, Technische Univerität München, Dissertation, 7-19-93, Chapter 3.5.1; pp. 65-69

[6] S. Ortmanns, A. Eiden, H. Ney, N. Coenen: "Look-Ahead Techniques for Fast Beam Search"; Proc. IEEE Intl. Conf. on Acoustics, Speech and Signal Processing; Munich 1997, pp. 1783-1786

[7] E. Bocchieri: "Vector Quantization for the Efficient Computation of Continuous Density Likelihoods", Proc. IEEE Intl. Conf. on Acoustics, Speech and Signal Processing; 1993:II-692 to II-695

1. Method for voice recognition,

in which spoken language is recognized using a voice recognition system, whereby

a) the voice recognition system runs on a computer;

b) a performance index of the computer is determined by a program for computer performance assessment;

c) an input quantity for the voice recognition system is automatically specified using the performance index;

d) the accuracy of the voice recognition system is automatically adjusted to the obtained computing power of the computer using this input quantity.

2. Method as claimed in claim 1,

in which the values for the system parameters of the voice recognition system are determined in that the values are computed from the input quantity in accordance with a mapping specification.

3. Method as claimed in claim 2,

in which the mapping specification is converted using a table.

4. Method as claimed in one of the preceding claims,

in which the setting process is executed during the operation of the voice recognition system.

5. Method as claimed in one of the preceding claims,

in which the voice recognition system comprises at least one of the following system parameters:

a) pruning threshold;

b) histogram pruning;

c) acoustic look-ahead;

d) language model look-ahead;

e) threshold for selecting distance parameters that are to be computed.

6. Method as claimed in claim 5,
in which at least one of the system parameters is specified using the input quantity.

7. Method as claimed in claim 6,
in which the system parameters are weighted with respect to their influence on a respective target quantity.

8. Method as claimed in claim 7,
in which a target quantity is at least one of the following quantities:
a) accuracy of the voice recognition system;
b) speed of the voice recognition system.

9. Method as claimed in claim 7 or 8,
in which the system parameters are weighted equally.

10. Method as claimed in claim 7 or 8,
in which the system parameters are weighted according to a prescribed weighting table.

11. Device for voice recognition,
a) in which a voice recognition system is provided,
b) in which means are provided for adjusting an accuracy of the voice recognition system, said means being so arranged that system parameters of the voice recognition system are adjustable, said system parameters being computable using an input quantity.

Abstract

Method and Device for Voice Recognition

A method and a device are set forth which make it possible to set an accuracy in a voice recognition process. To this end, system parameters of the voice recognition system are determined using an input quantity via a mapping specification, and the voice recognition system is set corresponding to the obtained values. Optionally, a voice recognition system can be adapted during operation, in order to guarantee an application-specific adaptation in a range between maximal quality in the voice recognition and optimally high speed in the execution of the voice recognition. The computer can also be set automatically in that a performance index of the computer has been determined in advance using a program provided for this purpose, which index represents a measure for the input quantity and thus guarantees an adequate operation of the voice recognition system on this computer.

IN THE UNITED STATES ELECTED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

"**SUBMITTAL OF DRAWINGS**"

APPLICANT: Alfred Hauenstein

SERIAL NO.: EXAMINER:

FILING DATE: ART UNIT:

INTERNATIONAL APPLICATION NO.: PCT/DE98/03366

INTERNATIONAL FILING DATE: 16 November 1998

INVENTION: Method and Device for Voice Recognition

Hon. Assistant Commissioner for Patents
Box PCT
Washington D.C. 20231

SIR:

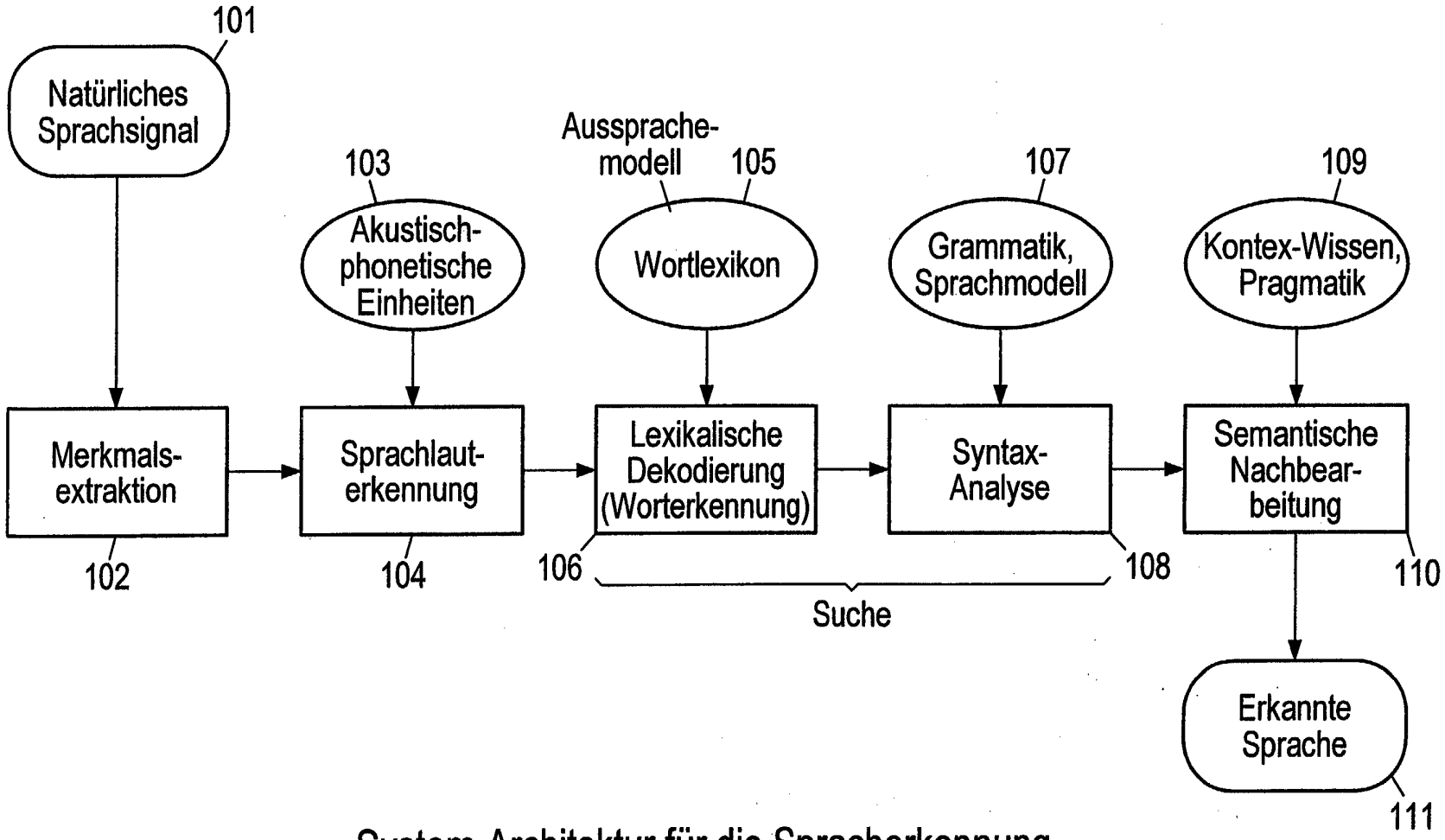
Enclosed are copies of the four sheets of drawings as filed in the present PCT application. Also enclosed is a second set of drawings marked with the English translation of the German text.

Respectfully submitted,

Melvin A. Robinson (reg. no. 31,870)
Hill & Simpson
A Professional Corporation
85th Floor Sears Tower
Chicago, Illinois 60606
Telephone: 312-876-0200 ext. 3044

ATTORNEY FOR APPLICANT

FIG 1



System-Architektur für die Spracherkennung

FIG 2

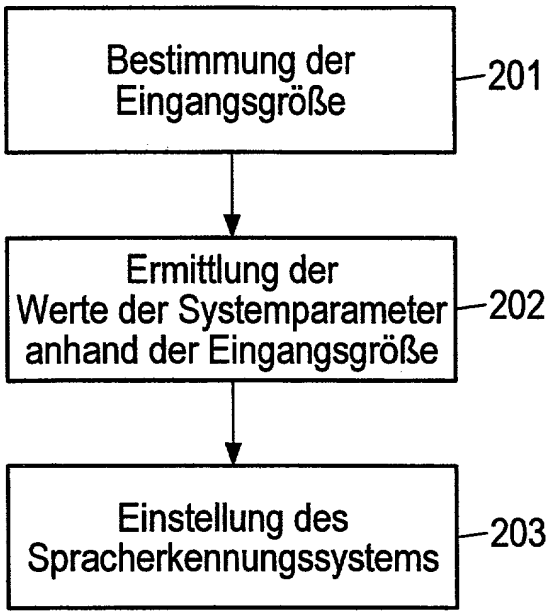

Bestimmung der Eingangsgröße
201
Ermittlung der Werte der Systemparameter anhand der Eingangsgröße
202
Einstellung des Spracherkennungssystems
203

FIG 7

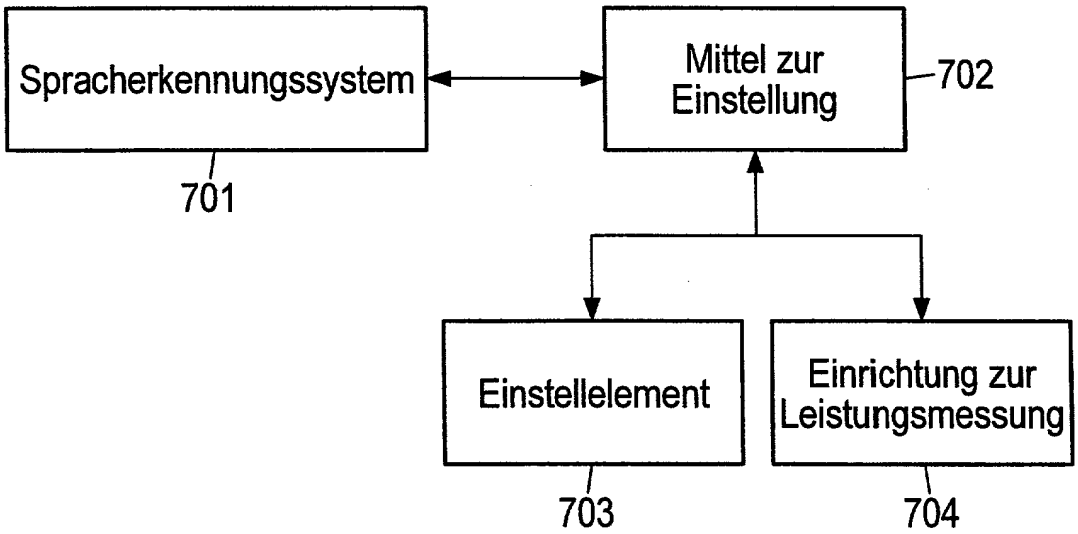

Spracherkennungssystem
701
Mittel zur Einstellung
702
Einstellelement
703
Einrichtung zur Leistungsmessung
704

FIG 3

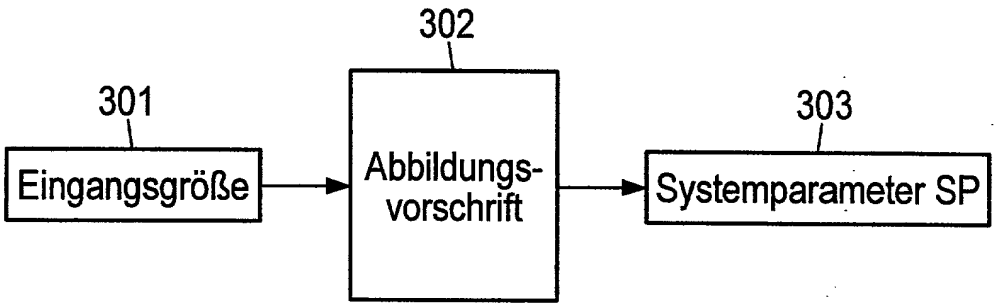

302
301
303
Eingangsgröße
Abbildungs-
vorschrift
Systemparameter SP

FIG 4

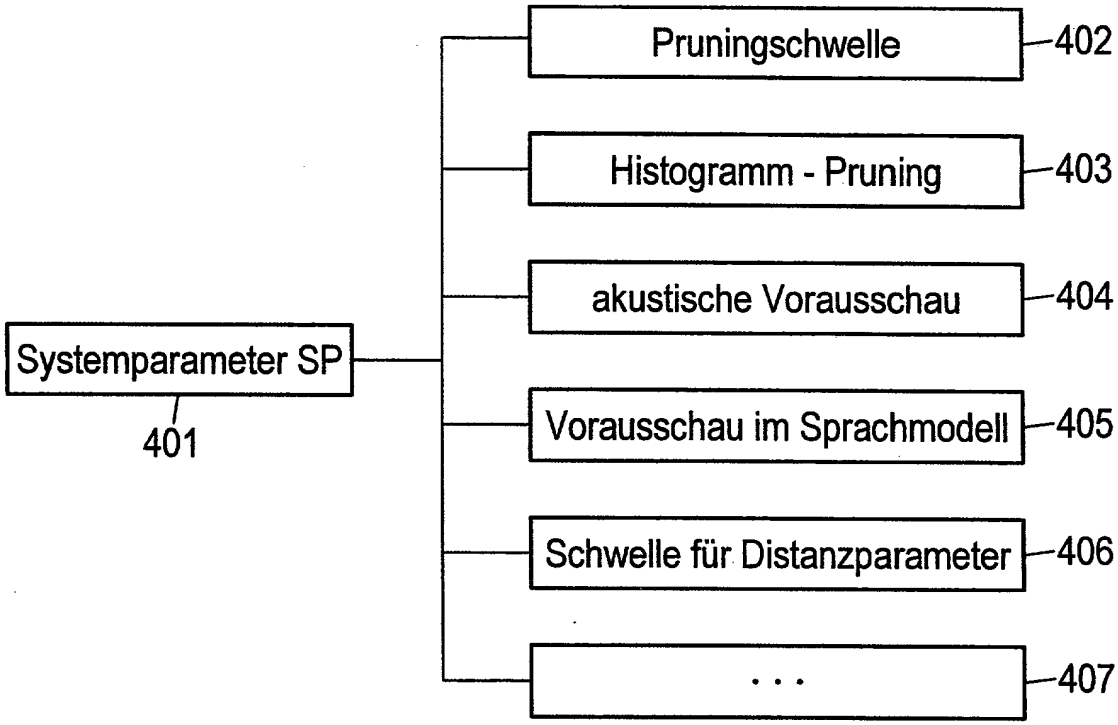

Pruningschwelle
402
Histogramm - Pruning
403
akustische Vorausschau
404
Systemparameter SP
401
Vorausschau im Sprachmodell
405
Schwelle für Distanzparameter
406
. . .
407

FIG 5

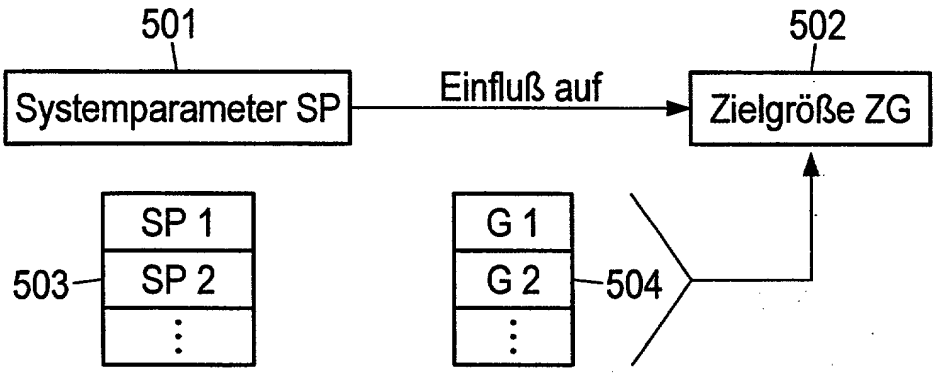
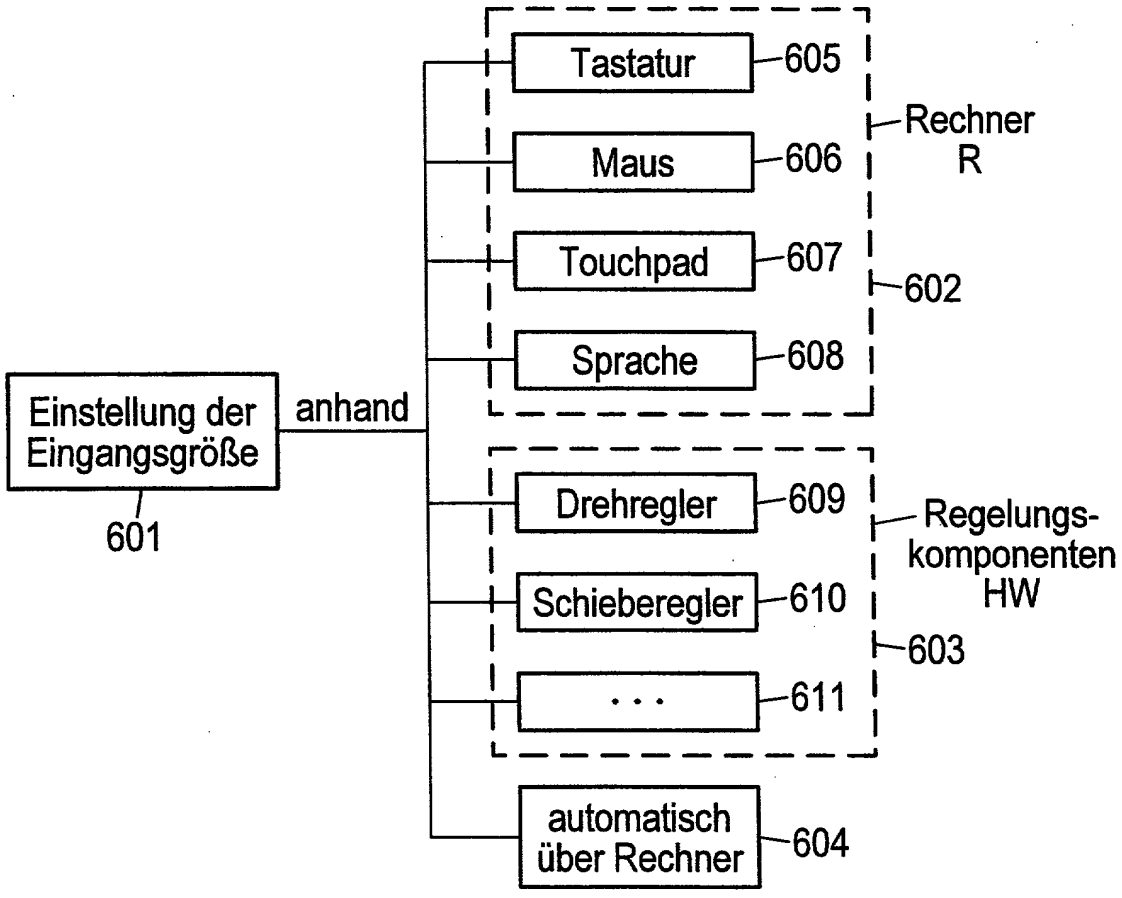
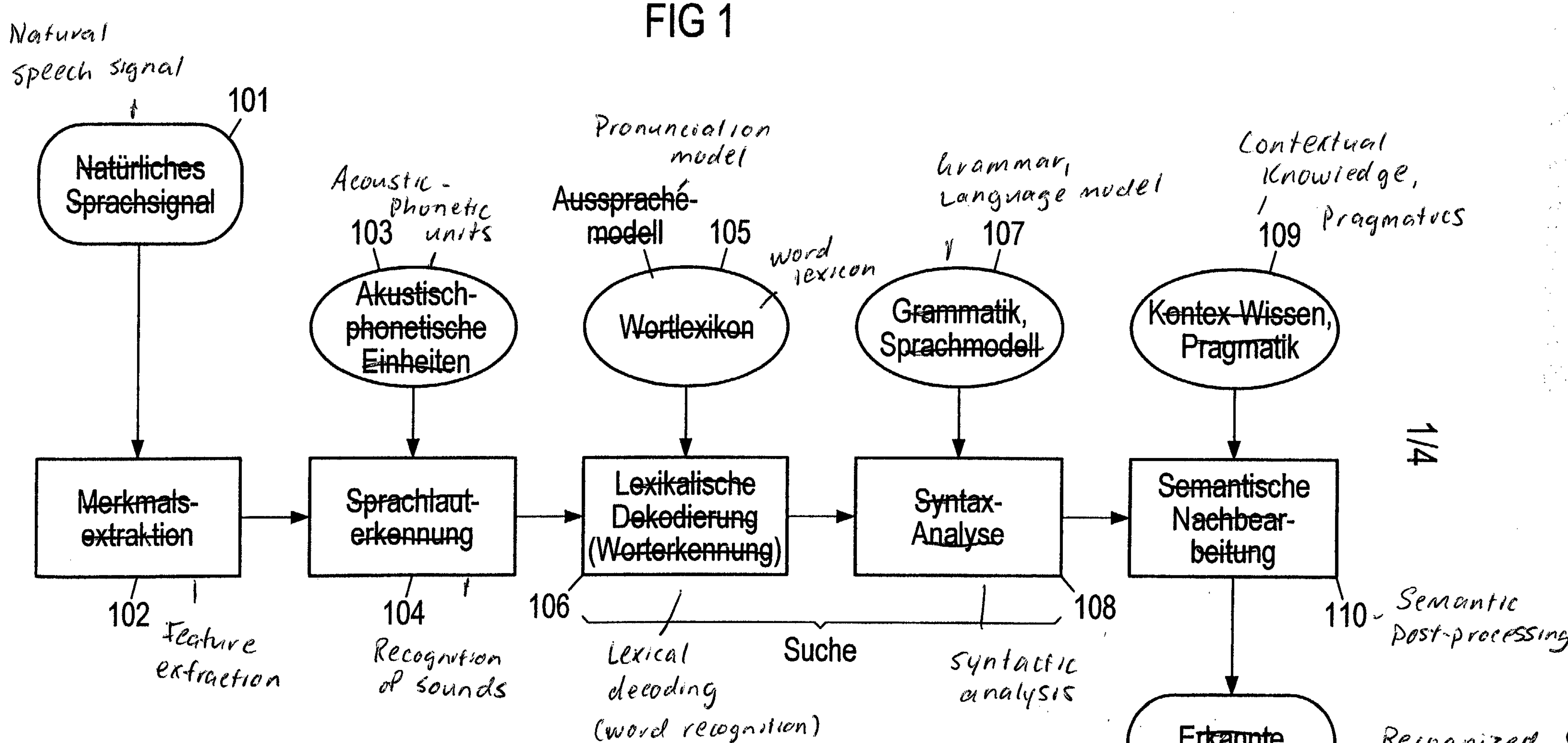

501
Systemparameter SP
Einfluß auf
502
Zielgröße ZG
SP 1
SP 2
503
G 1
G 2
504

FIG 6


Tastatur
605
Maus
606
Touchpad
607
Sprache
608
Rechner R
602
Einstellung der Eingangsgröße
anhand
601
Drehregler
609
Schieberegler
610
. . .
611
Regelungs-komponenten HW
603
automatisch über Rechner
604

09/555032

FIG 1



System-Architektur für die Spracherkennung

System Architechture for Voice Recognition

FIG 2

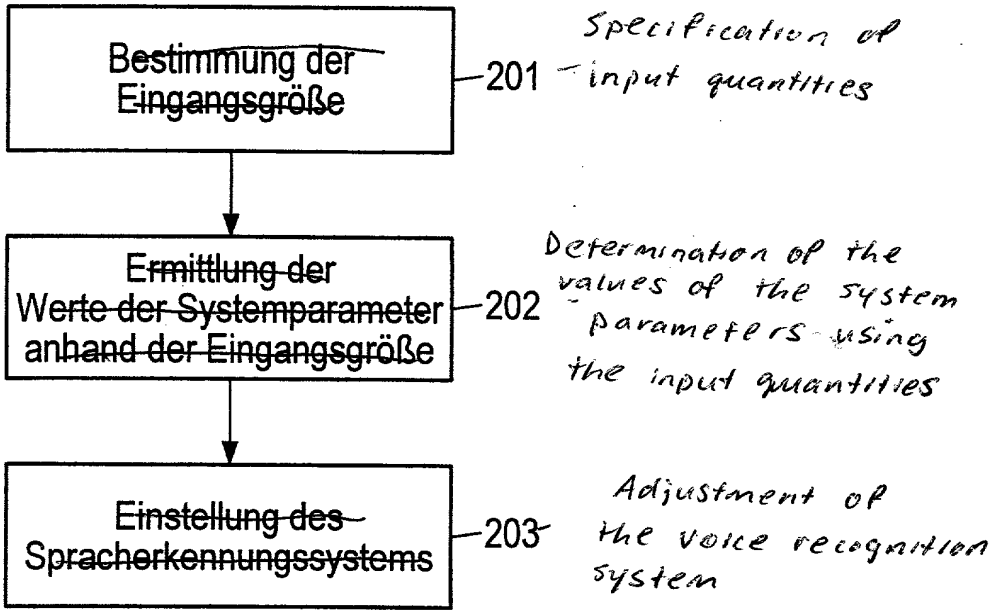

Bestimmung der Eingangsgröße
201
Specification of input quantities
Ermittlung der Werte der Systemparameter anhand der Eingangsgröße
202
Determination of the values of the system parameters using the input quantities
Einstellung des Spracherkennungssystems
203
Adjustment of the voice recognition system

FIG 7

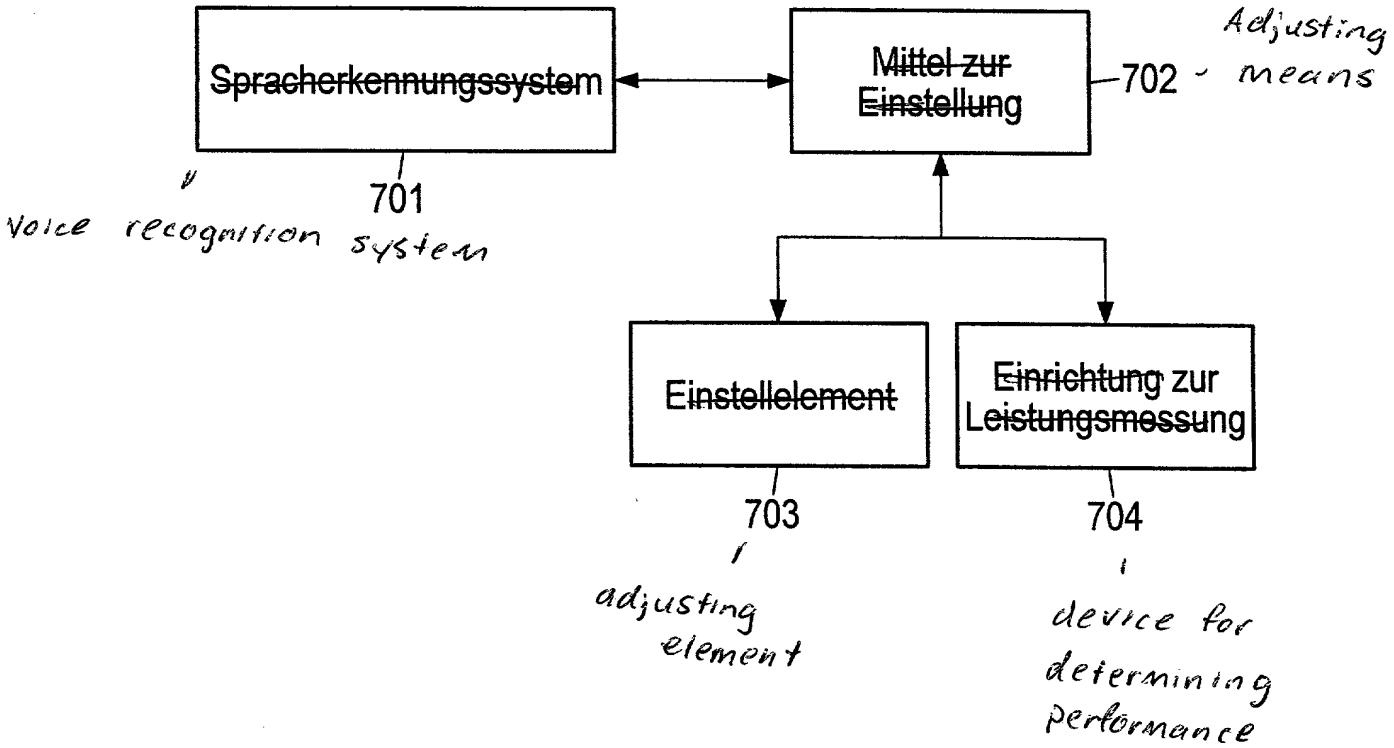

Spracherkennungssystem
701
Voice recognition system
Mittel zur Einstellung
702
Adjusting means
Einstellelement
703
adjusting element
Einrichtung zur Leistungsmessung
704
device for determining performance

FIG 3

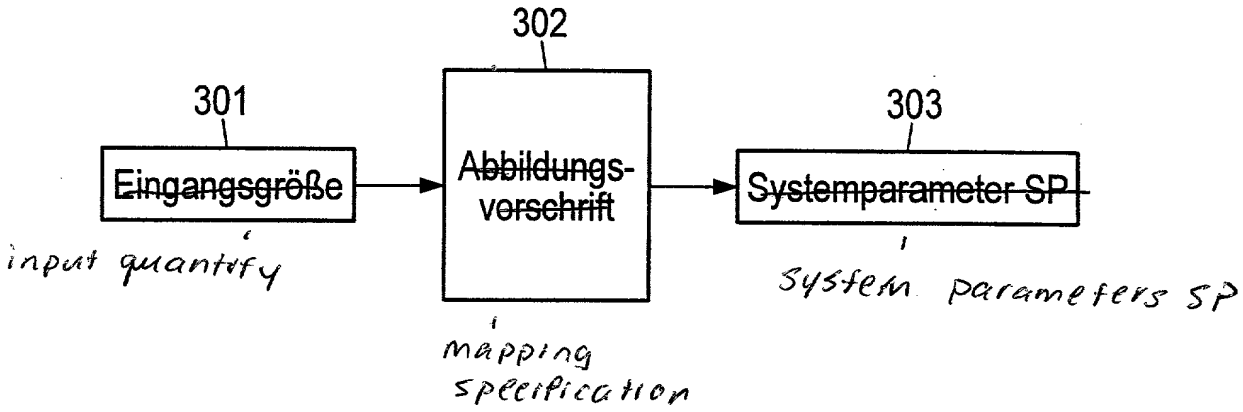

302
301
303
Eingangsgröße
Abbildungs-vorschrift
Systemparameter SP
input quantity
mapping specification
system parameters SP

FIG 4

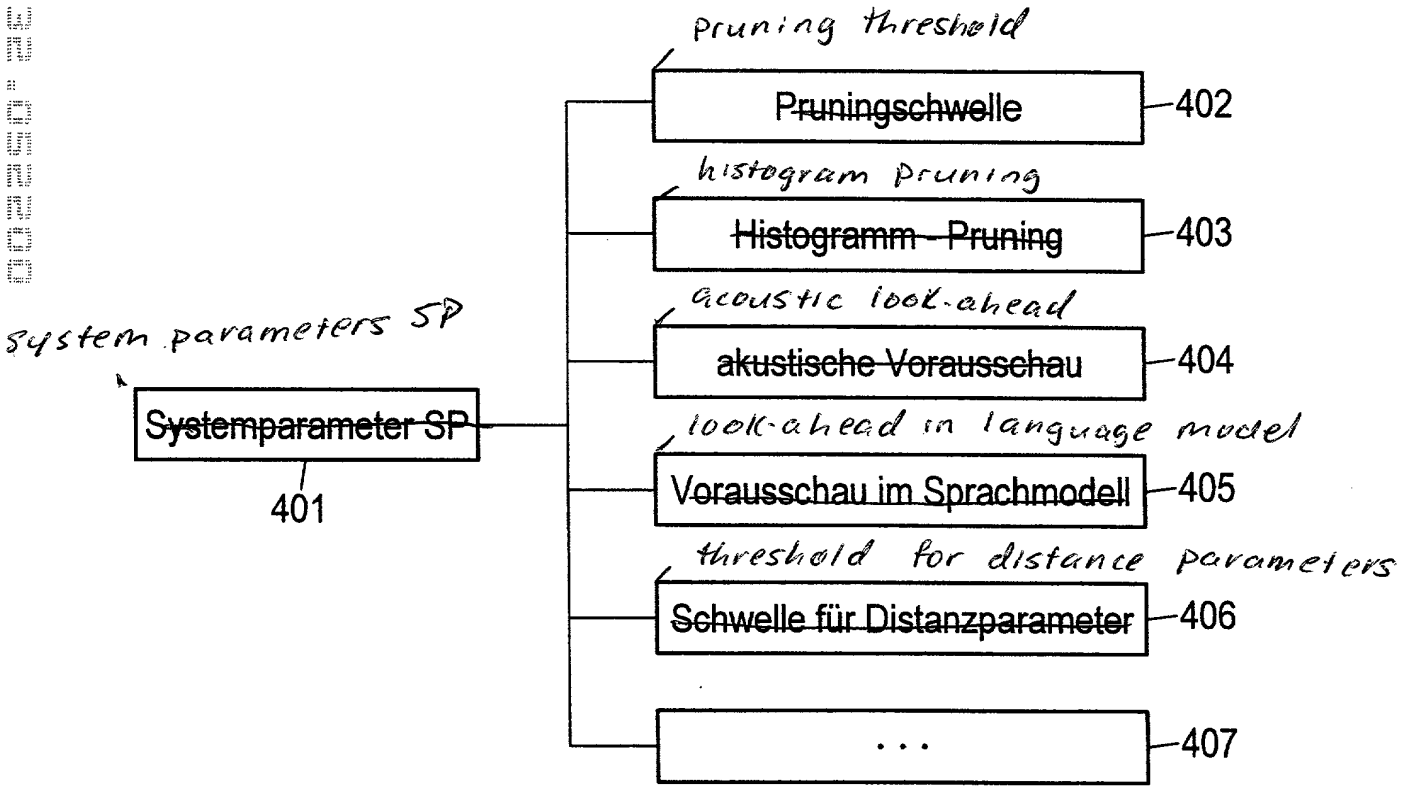

pruning threshold
Pruningschwelle
402
histogram pruning
Histogramm - Pruning
403
acoustic look-ahead
akustische Vorausschau
404
look-ahead in language model
Vorausschau im Sprachmodell
405
threshold for distance parameters
Schwelle für Distanzparameter
406
...
407
system parameters SP
Systemparameter SP
401

FIG 5

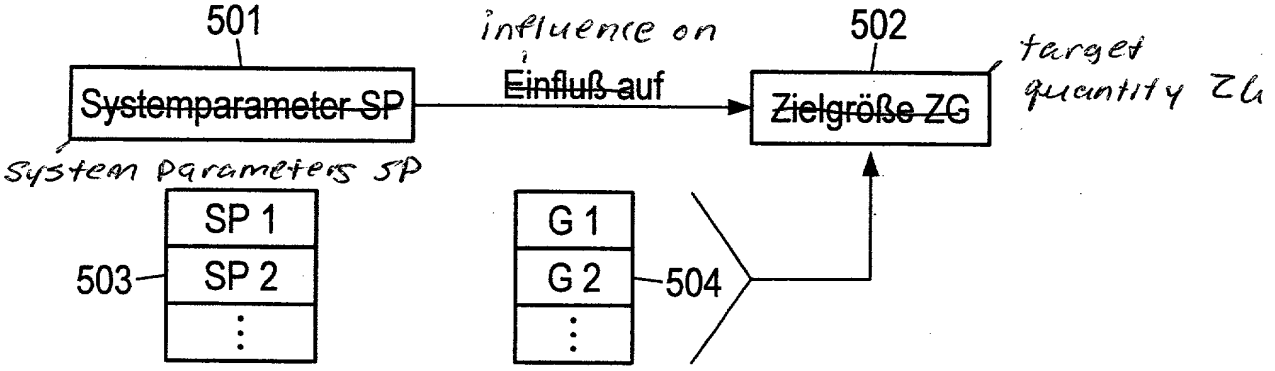
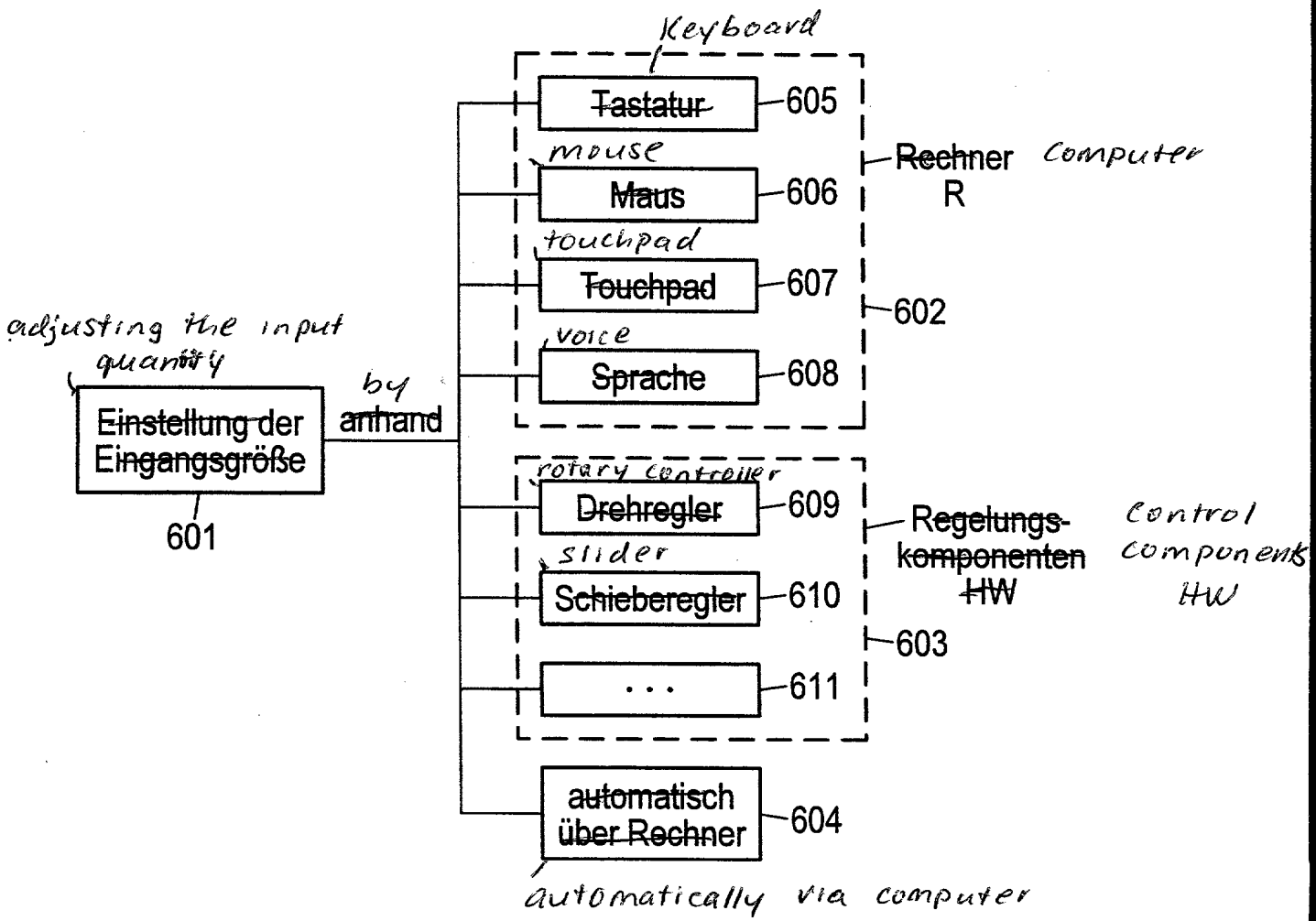

501
Systemparameter SP
System parameters SP
influence on
Einfluß auf
502
Zielgröße ZG
target quantity ZG
SP 1
SP 2
503
G 1
G 2
504

FIG 6


Keyboard
Tastatur
605
mouse
Maus
606
touchpad
Touchpad
607
voice
Sprache
608
Rechner
R
Computer
602
adjusting the input quantity
Einstellung der Eingangsgröße
601
by
anhand
rotary controller
Drehregler
609
slider
Schieberegler
610
...
611
Regelungs-komponenten HW
Control components HW
603
automatisch über Rechner
604
automatically via computer

Declaration and Power of Attorney For Patent Application
Erklärung Für Patentanmeldungen Mit Vollmacht
German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehörigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen,

dass ich, nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent beantragt wird für die Erfindung mit dem Titel:

Verfahren und Vorrichtung zur Spracherkennung
deren Beschreibung

(zutreffendes ankreuzen)
☒ hier beigefügt ist.
☐ am _____ als
PCT internationale Anmeldung
PCT Anmeldungsnummer _____
eingereicht wurde und am _____
abgeändert wurde (falls tatsächlich abgeändert).

Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeändert wurde.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäss Abschnitt 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 119 aller unten angegebenen Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde, und habe auch alle Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde nachstehend gekennzeichnet, die ein Anmeldedatum haben, das vor dem Anmeldedatum der Anmeldung liegt, für die Priorität beansprucht wird.

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

_____
_____
_____

the specification of which

(check one)
☐ is attached hereto.
☐ was filed on _____ as
PCT international application
PCT Application No. _____
and was amended on _____
(if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

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Patent and Trademark Office-U.S. DEPARTMENT OF COMMERCE

German Language Declaration

Prior foreign appplications
Priorität beansprucht

			Priority Claimed	
197 51 739.0	Germany	21. November 1997	☒	☐
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	Yes Ja	No Nein
			☐	☐
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	Yes Ja	No Nein
			☐	☐
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	Yes Ja	No Nein

Ich beanspruche hiermit gemäss Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozeßordnung der Vereinigten Staaten, Paragraph 122 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind.

I hereby claim the benefit under Title 35. United States Code. §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occured between the filing date of the prior application and the national or PCT international filing date of this application.

(Application Serial No.) (Anmeldeseriennummer)	(Filing Date) (Anmeldedatum)	(Status) (patentiert, anhängig, aufgegeben)	(Status) (patented, pending, abandoned)
(Application Serial No.) (Anmeldeseriennummer)	(Filing Date) (Anmeldedatum)	(Status) (patentiert, anhängig, aufgeben)	(Status) (patented, pending, abandoned)

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

German Language Declaration

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POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*

And I hereby appoint

Messrs. John D. Simpson (Registration No. 19,842) Lewis T. Steadman (17,074), William C. Stueber (16,453), P. Phillips Connor (19,259), Dennis A. Gross (24,410), Marvin Moody (16,549), Steven H. Noll (28,982), Brett A. Valiquet (27,841), Thomas I. Ross (29,275), Kevin W. Guynn (29,927), Edward A. Lehmann (22,312), James D. Hobart (24,149), Robert M. Barrett (30,142), James Van Santen (16,584), J. Arthur Gross (13,615), Richard J. Schwarz (13,472) and Melvin A. Robinson (31,870), David R. Metzger (32,919), John R. Garrett (27,888) all members of the firm of Hill, Steadman & Simpson, A Professional Corporation.

19

Telefongespräche bitte richten an: *(Name und Telefonnummer)*

Direct Telephone Calls to: *(name and telephone number)*

312/876-0200
Ext. _____

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Send Correspondence to:

HILL, STEADMAN & SIMPSON
A Professional Corporation
85th Floor Sears Tower, Chicago, Illinois 60606

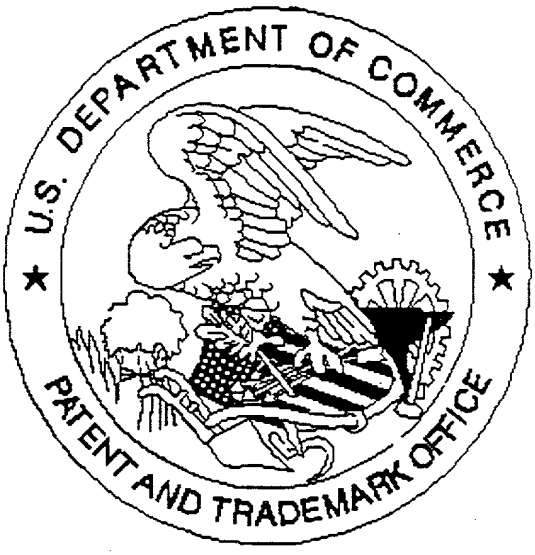
Voller Name des einzigen oder ursprünglichen Erfinders: Alfred Hauenstein	Full name of sole or first inventor:
Unterschrift des Erfinders Datum Alfred Hauenstein 5.Nov.98	Inventor's signature Date
Wohnsitz D-80939 München, Germany DEX	Residence
Staatsangehörigkeit Bundesrepublik Deutschland	Citizenship
Postanschrift Carl-Orff-Bogen 89 D-80939 München Bundesrepublik Deutschland	Post Office Addess
Voller Name des zweiten Miterfinders (falls zutreffend):	Full name of second joint inventor, if any:
Unterschrift des Erfinders Datum	Second Inventor's signature Date
Wohnsitz	Residence
Staatsangehörigkeit	Citizenship
Postanschrift	Post Office Address

(Bitte entsprechende Informationen und Unterschriften im Falle von dritten und weiteren Miterfindern angeben).

(Supply similar information and signature for third and subsequent joint inventors).

United States Patent & Trademark Office

Office of Initial Patent Examination -- Scanning Division



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☐ Page(s)_____ of _____ were not present for scanning. (Document title)

☐ Scanned copy is best available.